REMARKS

Claims 1, 2, 4, and 8-14 are pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103 – WILSON ET AL. IN VIEW OF R.B. MOORE ET AL., WILSON '777, AND DEBE ET AL.

Referring to the Office Action mailed May 24, 2006, claims 1, 4, 9, 11, and 12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wilson et al. "Thin-film catalyst layers for polymer electrolyte fuel cell electrodes," J. of Applied Electrochemistry, 22 (1992) (hereinafter Wilson) in view of R. B. Moore et al. "Procedure for Preparing Solution-Cast Perfluorosulfonate Ionomer Film and Membranes" 58 Anal. Chem. 2569-70 (1986) (hereinafter Moore), Wilson (U.S. Pat. No. 5,234,777) (hereinafter Wilson '777), and Debe et al. (U.S. Pat. No. 6,432,571) (hereinafter Debe). This rejection is respectfully traversed as the combination of these references fails to establish a *prima facie* case of obviousness.

In independent claim 1, a slurry comprising an ionically conductive material, an electrically conductive material, a catalyst, and a high boiling point casting solvent comprising water and a high boiling point solvent, the high boiling point solvent having a boiling temperature of from about 100°C to about 200°C, is applied to a non-porous polymeric substrate, the substrate being from about 12-250 µm thick and having sufficient structural integrity to facilitate reuse. The high boiling point solvent is removed to form a film on the substrate, whereupon the film is bonded to a membrane and the substrate is separated from the membrane so that the substrate can be reused. All remaining claims are dependent on claim 1.

The rejection has failed to assert at least one requisite condition for a *prima facie* case of obviousness. There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings to arrive at Applicant's invention. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

First, the combination of Wilson, Moore, Wilson '777, and Debe does not disclose a reusable non-porous polymeric substrate, which can be made of polytetrafluoroethylene, having a thickness of from about 12 to about 250 μm and having sufficient structural integrity to be reused. In fact, several features of the present invention's substrate are lacking in the combination of the aforementioned references.

The combination of references fails to disclose any thickness for the substrate, contrary to the present disclosure. The Office Action relies on the Debe reference for allegedly disclosing a Teflon® substrate having a thickness of 50 micrometers. Col. 23, lines 50-54. However, the Teflon® sheet in Debe is not a non-porous polymeric substrate as disclosed in the present invention and is not used in transferring a catalyst slurry to membrane. The 50 micrometer Teflon® sheet in Debe is performing an entirely different function than the non-porous polymeric substrate in the present disclosure. Thus, there is no motivation to combine the Debe reference with the other references.

The electrode backing layers in Debe, not the Teflon® sheet, are performing a function that is most closely analogous to the non-porous polymeric substrate of the present invention. Debe discloses that a membrane electrode assembly (MEA) can have five layers, including electrode backing layers 108, 110. Col. 4, line 62 et seq.; FIG. 1. The electrode backing layer comprises a *porous* polymer film including a polymer binder and conductive particles. Col. 6, lines 50-52. Debe also discloses at length the porosity of the electrode backing layer. Col. 6, line 61 to col. 7, line 21. A catalyst layer (electrode) can be coated on the surface of the electrode backing layer. Col. 6, lines 59-60. Pressure lamination can then be used to bond the catalyst coated electrode backing layer 208 with the ion conduction membrane 210. Col. 20, lines 14-22; FIG. 3A. Thus, the example given in the Debe disclosure presents the sandwich shown in FIG. 3A; i.e., a Nafion ion exchange membrane 210 (the PEM) between catalyst layers 206 (nanostructured catalyst) that were deposited on electrode backing layers 208 made of metallized polyimide substrate. Col. 23, step (a).

The sandwich shown in FIG. 3A is then set for static pressing, where a sheet of 50 micrometers thick polytetrafluoroethylene is placed on each side of the PEM, nanostructured substrate and polyimide stack (i.e., the sandwich). The original polyimide substrates (the electrode backing layers, *not* the Teflon® sheets) are then peeled away from the PEM leaving the catalyst attached to the surface of the PEM. Col. 23, lines 62-65. There is no further mention of the Teflon® sheets, but it seems that they are likely removed with the polyimide substrates since they are outside of the electrode backing layers.

Thus, the Debe reference deposits catalyst on porous polyimide substrates that are later peeled away to leave the catalyst on the PEM. The 50 micrometer thick Teflon® sheets do not have any express purpose in the Debe reference, and certainly are not performing the role of the non-porous polymeric substrate as disclosed in the present invention. The most closely analogous feature is the polyimide substrates in Debe, which however are expressly porous as described in detail therein, and therefore are only analogous to the present invention in that they receive the catalyst film and are used to press the catalyst to the PEM.

Second, the reference combination, including the Debe reference, does not provide any suggestion or motivation for using a non-porous polymeric substrate. In fact, the Debe reference teaches away from using a non-porous polymeric substrate by expressly using a porous electrode backing layer. See Debe's claimed advantages and purpose of the porosity of the electrode backing layer in col. 6, line 61 et seq. In contrast, Applicants have demonstrated in FIGS. 8 and 9 and paragraphs [0061] to [0062] of the present disclosure the clear advantages of using a non-porous substrate versus a porous substrate. It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983). Consequently, since there is no disclosure in these references of the species of non-porous polymeric substrates the present invention cannot be obvious.

To summarize, there are several features of the substrate of the present invention, including thickness, porosity, and reusability, that are missing from the combination of cited references. As a result the present invention is not obvious in view of these references.

In response to the Examiner's rebuttal comments in paragraphs 9 and 10 of the Office Action, Applicants wish to draw the Examiner's attention to the comparative fuel cell performance data in the present disclosure at paragraphs [0061] and [0062] and Figures 8 and 9. MEAs were formed from decals made with a non-porous substrate (2 mil thick ETFE) and a porous substrate (ePTFE). The MEA prepared with the non-porous substrate did not require additional spraying of ionomer on top of the catalyst coating before decal transfer, unlike the porous substrate. In particular, as shown in Figure 9, the non-porous substrate decal method demonstrates improved performance over the porous decal method. Paragraph [0062] also discloses several advantages of using a non-porous substrate in the present disclosure. Thus, there is a difference between porous and non-porous substrates.

Applicants have expressly noted in their present disclosure the selection of non-porous substrates. Likewise, the Debe reference recognizes the difference between porous and non-porous substrates and discloses at length the selection of a porous substrate. Thus, it is generally recognized in the art that the terms "porous" and "non-porous" describe different materials, even without the recitation of a porosity value.

In addition, Applicants' previous comment regarding use of a mold release in the Wilson reference was to infer that the Wilson substrate is likely a porous substrate. Applicant does not recite the absence of a mold release in the present claims. The use of the mold release in Wilson suggests that release of the catalyst layer from the substrate is problematic in Wilson. A porous substrate can present such a problem in removing the catalyst layer from the substrate; therefore, the inference is that the substrate in Wilson could be porous.

Applicants note the remaining rejections pertain to claims dependent on independent claim 1. These include: rejection of claims 2, 13, and 14 under 35 U.S.C. § 103(a) as being unpatentable over Wilson in view of Moore, Wilson '777, and Debe et al. in further view of Tou (U.S. Pat. No. 5,518,831); rejection of claim 8 under 35 U.S.C. § 103(a) as being unpatentable over Wilson in view of Moore, Wilson '777, and Debe et al. in further view of Sompalli et al. (U.S. Pat. No. 6,524,736); and rejection of claim 10 under 35 U.S.C. § 103(a) as being unpatentable over Wilson in view of Moore, Wilson '777, and Debe et al. in further view of Grot (U.S. Pat. No. 5,330,860). These rejections are respectfully traversed.

Applicants submit that these rejections are traversed, as the preceding arguments have demonstrated that claim 1 is not obvious in view of the preceding combination of Wilson in view of Moore, Wilson '777, and Debe et al. and the remaining rejections all depend on these same base references. Hence, all pending dependent claims (*i.e.*, claims 2, 4, and 8-14) are not obvious. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). Withdrawal of the rejections and reconsideration are respectfully requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this response is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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